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METHODS OF DESTROYING RATS.

BY

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., May 15, 1907.

SIR: I have the honor to transmit herewith for publication Farmers' Bulletin No. 297, containing concise directions for the destruction of rats, prepared by David E. Lantz, an assistant in this Bureau. The damage done by these rodents, both in cities and in the country, is enormous, and the calls for practical methods of destroying them are correspondingly numerous and urgent. It is believed that by following the directions here given the numbers of this pest can be greatly reduced and the losses from them proportionally diminished.

Respectfully,

C. HART MERRIAM,
Chief, Biological Survey.

Hon. JAMES WILSON,
Secretary of Agriculture.

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METHODS OF DESTROYING RATS.

INTRODUCTION.

The brown or Norway rat (*Mus norvegicus*) is the worst mammal pest in the United States, the losses from its depredations amounting to many millions of dollars yearly—to more, indeed, than the losses from all other injurious mammals combined.[a] In addition to its destructive habits, this rat is now known to be an active agent in disseminating infectious diseases, a fact which renders measures for its destruction doubly important.

Introduced into America about the year 1775, the brown rat has supplanted and nearly exterminated its less robust relative, the black rat, and despite the incessant warfare of man has extended its range and steadily increased in numbers. Its dominance is due to its great fecundity and its ability to adapt itself to all sorts of conditions. It breeds three or four times a year and produces from 6 to 12, and even more, young at a litter. Young females breed when only 4 or 5 months old. The species is practically omniverous, feeding upon all kinds of animal and vegetable matter. It makes its home in the open field, the hedge row, and the river bank, as well as in stone walls, piers, and all kinds of buildings. It destroys grains when newly planted, while growing, and in the shock, stack, mow, crib, granary, mill, elevator, or ship's hold, and also in the bin and feed trough. It invades store and warehouse and destroys fur, laces, silks, carpets, leather goods, and groceries. It attacks fruits, vegetables, and meats in the markets, and destroys by pollution ten times as much as it actually eats. It carries disease germs from house to house and bubonic plague from city to city. It causes disastrous conflagrations; floods houses by gnawing lead water pipes; ruins artificial ponds and

[a] Several species of rats are known as "house rats," including the black rat (*Mus rattus*), the roof rat (*Mus alexandrinus*), and the brown rat (*Mus norvegicus*). Of these, the last is the commonest and most widespread in this country. Not one of these species is a native, but all were imported from the Old World. As their habits in general are similar, the instructions given in the bulletin apply alike to all.

embankments by burrowing; destroys the farmers' pigs, eggs, and young poultry; eats the eggs and young of song and game birds; and damages foundations, floors, doors, and furnishings of dwellings.

METHODS OF DESTROYING RATS.

A compilation of all the methods of destroying rats practiced in historic times would fill a volume. Unfortunately, the greater number of them are worthless or impracticable. Few have more than temporary effect upon their numbers, and even the best of them fail unless persistently applied. Conditions vary so much that no one method of dealing with this pest is applicable in all cases. Among the more important measures to be recommended for actively combating the brown rat are: (1) Poisons; (2) traps; (3) ferrets; (4) fumigation, and (5) rat-proof construction of buildings.

POISONING.

Barium Carbonate.—One of the cheapest and most effective poisons for rats and mice is barium carbonate, or barytes. This mineral has the advantage of being without taste or smell; and, in the small quantities used in poisoning rats and mice, is harmless to larger animals. Its action on rodents is slow, but reasonably sure, and has the further advantage that the animals before dying, if exit be possible, usually leave the premises in search of water. Its employment in houses, therefore, is rarely followed by the annoying odor which attends the use of the more virulent poisons.

The poison may be fed in the form of a dough made of one-fifth barytes and four-fifths meal, but a more convenient bait is ordinary oatmeal, with about one-eighth of its bulk of barytes, mixed with water into a stiff dough; or the barytes may be spread upon bread and butter or moistened toast. The prepared bait should be placed in rat runs, a small quantity at a place. If a single application of the poison fails to drive all rats from the premises, it should be repeated with a change of bait.

Strychnine.—Strychnine is a more virulent poison, but its action is so rapid that the animals often die upon the premises, a circumstance which prohibits its use in occupied dwellings. Elsewhere strychnine may be employed with great success. Dry strychnine crystals may be inserted in small pieces of raw meat, Vienna sausage, or toasted cheese, and these placed in the rat runs; or oatmeal may be wet with a strychnine sirup, and small quantities laid out in the same way.

Strychnine sirup is prepared as follows: Dissolve a half ounce of strychnia sulphate in a pint of boiling water; add a pint of thick

sugar sirup and stir thoroughly. A smaller quantity of the poison may be prepared with a proportional quantity of water. In preparing the bait it is necessary that all the oatmeal should be moistened with sirup. Wheat is the most convenient alternative bait. It should be soaked over night in the strychnine sirup.

Other Poisons.—The two poisons most commonly used for rats and mice are arsenic and phosphorus, nearly all commercial preparations containing one or the other as a basis. While experiments prove that rats have great powers of resistance to arsenic, it may sometimes be used advantageously as an alternative poison. Preparations of phosphorus sold by druggists are often too weak to be effective; and home-made mixtures, when of sufficient strength, are dangerous, as rats may carry the baits into walls or crannies and thus cause fires. For these and other reasons the Biological Survey does not recommend preparations containing phosphorus.

Poison in the Poultry House.—For poisoning rats in buildings and yards occupied by poultry, the following method is recommended: Two wooden boxes should be used, one considerably larger than the other, and each having two or more holes in the sides large enough to admit rats. The poisoned bait should be placed on the bottom and near the middle of the larger box, and the smaller box should then be inverted over it. Rats thus have free access to the bait, but fowls are excluded.

TRAPPING.

Trapping, if persistently followed, is one of the most effective methods of destroying rats. The improved modern traps with a wire fall released by a baited trigger and driven by a coiled spring have marked advantages over the old forms, and many of them may be used at the same time. These traps, sometimes called guillotine traps, are of many designs, but the more simply constructed are to be preferred. Probably those made entirely of metal are the best, as they are less likely to absorb and retain odors.

In illustration of the effectiveness of traps, it may be related that a year or two ago a large department store in Washington experienced heavy losses of gloves, lace curtains, and other merchandise from rat depredations. For several months the damages amounted to from $10 to $30 nightly. After many unsuccessful attempts to abate the nuisance the managers were advised to try the improved traps. As a result 136 rats were killed during the first twenty nights, when the losses practically ceased, and the method has been continued in the store ever since with satisfactory results.

Guillotine traps should be baited with small pieces of Vienna sausage (Wienerwurst) or bacon. The trigger wire should be bent

inward to bring the bait into proper position to permit the fall to strike the rat in the neck, as shown in the illustration (fig. 1).

Other excellent baits for rats are oatmeal, toasted cheese, toasted bread (buttered), and sunflower or pumpkin seeds. When seed, grain, or meal is used with a guillotine trap, it may be placed on the trigger plate, or the trigger wire may be bent outward and the bait sprinkled under it.

Wire cage traps (French) also are useful for catching rats, but in the long run the kinds recommended above are much more effective. While trapping, all other food should be removed and the trap bait should be changed often. Rats are very suspicious, and baits and traps should be handled as little as possible. Increased success may

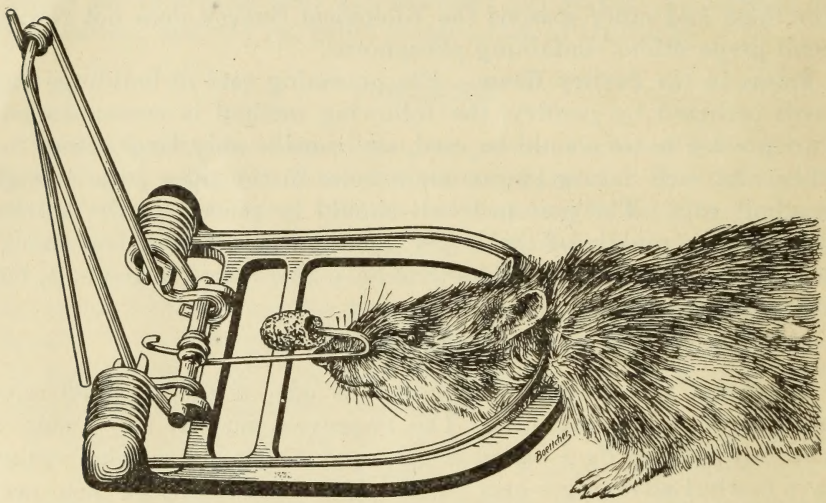

FIG. 1.—Method of baiting guillotine trap.

be secured both in trapping and poisoning if the rats are fed for a night or two with the kinds of food to be used for bait.

USE OF FERRETS AND DOGS.

A ferret is useful for the purpose of driving rats out of burrows and other hiding places so that dogs can capture them. An experienced person with dogs and ferrets trained to work together can kill many rats when they are numerous. But the amateur ferreter is likely to be greatly disappointed.

In the rice fields of the far East the natives build numerous piles of brush and rice straw and leave them for several days until many rats have taken shelter in them. A portable bamboo inclosure several feet in height is then set up around each pile in succession and

the straw and brush are thrown out over the top while dogs and men kill the trapped rodents. Large numbers are killed in this way, and the plan with modifications may be utilized in America with satisfactory results. A wire netting of fine mesh may be used for the inclosure. The scheme is applicable at the removal of grain, straw, or hay stacks, as well as brush piles.

FUMIGATION.

Rats may be destroyed in their burrows in the fields, and, still more important, in levees and rice-field dikes, by the use of carbon bisulphid. A wad of cotton or other absorbent material is saturated with the liquid and pushed into the burrow, the opening being packed with soil to prevent escape of the gas. All animals in the burrow are asphyxiated. Fumigation about buildings is not so effective, as the gas can not readily be confined.

RAT-PROOF CONSTRUCTION.

The best way of excluding rats from buildings, whether in the city or country, is by the use of cement in construction. As the advantages of this material are coming to be generally understood, its use is rapidly extending to all kinds of building. Dwellings, dairies, barns, stables, chicken houses, ice houses, bridges, dams, silos, tanks, cisterns, root-cellars, hotbeds, sidewalks, and curbs are now often made wholly of concrete. In constructing dwelling houses the additional cost of making the foundations rat-proof is slight as compared with the advantages. The cellar walls should have concrete footings and the walls themselves be laid in cement mortar. The cellar floor should be of " medium " rather than " lean " concrete, and all water and drain pipes should be surrounded with concrete. Even an old cellar may be made rat-proof at comparatively small expense. Rat holes may be permanently closed by a mixture of cement, sand, and broken glass or sharp bits of stone.

Rat-proof granaries, corncribs, and poultry houses may be constructed by a liberal use of concrete in the foundations and floors.

Rats, mice, and sparrows may be excluded from corncribs by the use of either an inner or an outer covering of fine-mesh wire netting sufficiently heavy to resist the teeth of rats.

The common custom of setting corncribs upon posts with inverted pans at the top often fails because the posts are not long enough to insure that the lower cracks of the structure are beyond jumping reach of rats. The posts should project at least 3 feet above the surface of the ground.

NATURAL ENEMIES OF RATS.

The value of carnivorous mammals and the larger birds of prey in destroying rats should be more fully recognized, especially by the farmer and the game preserver. Chief among the animals that are useful in destroying these rodents are the fox, skunk, and weasel, and the larger species of owls and hawks. Rats destroy more poultry and game, both eggs and young chicks, than all the birds and wild mammals named combined, yet some of our most useful birds of prey and carnivorous mammals are persecuted almost to the point of extinction. An enlightened public sentiment should cause the repeal of all bounties on these animals and afford protection to the majority of them.

CONCLUSIONS.

By the persistent use of traps, occasional resort to poison, and the exercise of forethought in the construction of farm buildings so as to minimize the opportunities for harborage, farmers and others may prevent the greater part of the loss and annoyance they now experience from rat depredations. The same statement applies in great measure to city and village conditions. Hence cooperation in the warfare on rats is particularly important and can not be too strongly urged.

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